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cated. This uncertainty as to what actually happens showed itself clearly when the energy of the colliding bodies was varied by using balls of different weights; as Dr. Angell says (p. 14), this method produces a change in quality as well as in intensity. It is at least possible that a variation of the energy by varying the height of fall also produces a change in quality. We can, to a certain degree, abstract from a consideration of anything but the intensity, but even an unconscious difference can influence the decision. Taking these facts into consideration, the amount of variation from the double of the stimulus corresponding to a double sensation is really less than would be expected. The great care exercised in this case has reduced the variation in general to less than 20%. Finally, it is no objection to the method of multiple stimuli that we have to *learn* to estimate intensities; the same is true of all estimations of length, time, etc.

The latter half of the dissertation is devoted to a proof of the applicability of the method of successive gradations to intensities of noise and to determining whether the estimated middle intensity follows any law.

The variation of the middle stimulus can be regular or irregular. If regular, the successive steps by which it is varied can be different in direction, in size, in number, and in the point of starting. The influence of the difference in size is shown in tables IV, V, and VI. To eliminate the influence of the point of starting this was varied as much as possible. The influence of these matters is so great that Dr. Angell remarks: "I am of the opinion that in all our experiments the factors of expectation and habit are within quite distant limits much more influential in the estimates than the intensity of the varied stimulus itself" (p. 36). Recourse was had to irregular variations of the middle stimulus in the manner employed by Lorenz. Various intensities between the two extremes were judged as above (o), at (m), or below (u) the middle; then o' and u' were taken thus: $o' = o + \frac{m}{2}$ and $u' = u + \frac{m}{2}$. This is, in fact, the only satisfactory form of the method of successive gradations as applied to successive stimuli. The results are excellently shown in the accompanying plate. The confirmation of Weber's law which here occurs is one of the most important contributions on that subject.

E. W. SCRIPTURE.

Le Cervelet et ses Fonctions, par FRÉDÉRIC COURMONT. Paris, Alcan, 1891. — 8vo., pp. 600.

The cerebellum, as is well known, is not considered by our contemporary physiology to have any special connection with consciousness, but is treated as a co-ordinator of sensory and locomotor functions exclusively.

Most physiologists, however, readily admit that the functions of this large and complicated organ are still very obscure. Dr. Courmont's book is assuredly the most systematic attempt yet made to throw light into the darkness. He believes that the evidence points to a distinct psychic function for the cerebellum. As the cerebral hemispheres are the organs of the intellectual processes, so the cerebellum, according to him, is the organ of the feelings, sentiments, and emotions.

This rather startling thesis is defended at great length, but in so clear and well-ordered a way that the book can be easily and rapidly read. After three chapters, abounding (like all the chapters of the book), with quotations from the most accredited authors, and destined to prove the chaotic character of opinion about the cerebellum, the author begins the methodical array of his own proofs, as follows:

1. The histology of the cerebellum is analogous to that of the cerebrum, and their anatomical union is extremely intimate.

2 and 3. The cerebellum receives important contributions from the posterior or sensitive columns of the spinal cord; and the clinical reports which are supposed to prove that cerebellar-lesions do not affect the 'mind,' are either full of omissions or do contain references to *emotional* disorder, either of defect or excess. These facts warrant the presumption that the cerebellum has psychic functions of some kind.

4. The vivisections of Vulpian and Ferrier show that animals still give signs of pain after the hemispheres are removed. Now the cerebellum is as likely to be the source of this pain, as the pons or medulla, one or other of which is usually held responsible for it.

5. The record of clinical observations where the cerebellum alone has been found diseased shows unmistakably the connection between this organ and the emotional life. Where the disease is irritative, *e.g.* in cases of tubercles, tumors, or sclerosis, abscess, *etc.*, we may find hypochondria, melancholy, irascibility, and especially terror. Sometimes these symptoms alternate with hilarity. Loud cries are a very frequent symptom; and though in many cases they are due to intense pain in the head, in other cases they occur where there is no concomitant pain. The peculiar expression of pain or anxiety in the face is often noted. The emotional symptoms, as well as the cries, are apt to appear paroxysmally. Where, on the contrary, the lesion is destructive, a profound indifference or apathy is noted, even with intelligence preserved. [The lesions in many of Dr. Courmont's quoted cases are not clearly distinguishable as irritative or destructive. — W. J.] Lesions of the pons (which anatomically is essentially the commissure of the two cerebellar halves) show the same results as lesions of the cerebellum itself.

6. In woman, in whom, as compared with man, the emotional life

preponderates, the cerebellum is relatively to the cerebrum larger than in man.

7. Alcohol, which affects the motor co-ordinations carried on by the cerebellum, affects first of all and chiefly the emotions.

8. Rats whose cerebellum was extirpated by Dr. Courmont ceased to give any signs of fear or anger.

9. Comparative anatomy shows that the development of the cerebellum runs parallel with the activity of the emotional life. Whales show great affection for their young, dolphins cry aloud and weep, and seals and sea-lions are notorious for the vivacity of all their feelings; but all these animals are remarkable for the size and complication of the cerebellum. In reptiles, which are emotionally at the opposite extreme, the cerebellum is at its minimum. Compare also birds with fishes. The only fishes which show much emotional life are the sharks and rays, and in them the cerebellum is exceptionally developed.

10. The nerves concerned with the emotions and their expression can be traced into the cerebellum or into the region of its stem (pons, valve of Vieussens, restiform bodies). Such are the pathetic, the trigeminal, the facial, and the auditory.

11. Emotional insanity may coexist with sound senses and intellect. In many cases of this sort the cerebellum has been found diseased. In general paralysis the cerebellum is usually affected where the psychic sensibility is increased.

12. The cerebellum is a sensitive organ, not only by its anatomical connections, but by the evidence of direct pricking, *etc.*, and of intense pain when it is diseased. Hyperæsthesia and other disturbances of tactile sensibility are among the most constant results of its injury. The motor disturbances which are also observed must be regarded as indirect results, similar to what occurs in reflex paralysis.

Dr. Courmont's conclusion is that whilst the cerebral hemispheres possess whatever sensory functions are sufficient for the *cognitive* life, to the cerebellum those concerned in psychic sensibility, properly so called, such as pleasure, pain, emotional feeling, and the feeling of bodily condition, are assigned. Dr. Courmont uses the term psychic sensibility without any particular analysis. In general this lack of minute analysis gives to his book a certain old-fashioned air. The day is past when such lump-terms as 'reason' or 'intelligence' can be assigned as the functions of such a lump-organ as the 'brain.' Both on the mental and the anatomical side we now distinguish elements and try to correlate them. But our author still treats the cerebellum as a whole, not distinguishing the *vermis* from the lateral lobes any more expressly than he distinguishes bodily pain from 'sentiments.' The reader has many doubts as he goes along. Destructive and irritative lesions are by no means consistently held apart in his pages. Locomotor functions are too little kept in view. The physiology of emotional expression is not brought into evidence at all. There are, it is well known, cases in which the face is paralyzed for voluntary movements, but reacts in emotion. Could not these have been studied? Bechterew has recently concluded from vivisections that the *thalami* have to do with emotional expression. In the array of cerebellum cases quoted by Nothnagel in his *Topische Diagnostik*, emotional disturbance is mentioned, if our count is correct, only twice. Dr. Courmont would explain this as the result of the traditional *parti-pris* to notice only two things, namely, absence of 'intellectual' symptoms, and disturbances of co-ordination. It may be so, but the point seems a little overstrained. In brief, then, the book before us is rather that of a man of 'one idea' than of an all-round investigator. Such a book, however, may be an extremely valuable breaker of ground, and it will be strange if our author's theory does not prove the starting-point of a great deal of fresh observation and experimentation upon the decidedly mysterious organ of which it treats. All that one can now say is that he has established a presumption that emotions and vocal expressions, of a painful kind especially, have some connection with the cerebellum. Finally, if Dr. Courmont had used fewer commas, his book would have been even smoother reading than it is.

W. JAMES.

The Spirit of Modern Philosophy. An Essay in the Form of Lectures. By JOSIAH ROYCE, Ph.D., Assistant Professor of Philosophy in Harvard University. Boston and New York, Houghton, Mifflin, & Co., 1892. — pp. xv, 519.

The nucleus of this book was a number of non-technical lectures, in which the author attempted to describe to a circle of friends something in regard to the chief names and problems of modern philosophy. After being enlarged several times, and delivered before public audiences in Harvard University and elsewhere, the author now presents them to the public in book form, under the above title. The work has two main divisions. The first part is devoted to an historical account of the most prominent philosophical thinkers and their problems, from the seventeenth century to the present time. In the second part we have the author's own confession of philosophical faith, which, he claims, is not without originality. His doctrine however he tells us, is no new gospel, but a reconstruction, a synthesis of truths discovered through a study of the history of thought.

The book is written in a simple and non-technical fashion, the style is easy and unconventional, and the treatment of problems, though sometimes diffuse, is always interesting. The artistic biographical